

Upper plate heterogeneities in the Hyuga-nada region inferred from new and legacy OBS refraction data

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Subduction of seamounts is expected to cause significant structural heterogeneities in the overriding plate and along the plate interface. The Hyuga-nada region located in the westernmost part of the Nankai Trough provides a great field to study this phenomena because a series of seamounts consisting of the Kyushu-Palau Ridge have been subducting. In order to finely image the subduction structure in the Hyuga-nada region, over the last two years we collected seismic refraction data along four lines (HYU01-04) using densely distributed ocean bottom seismographs (OBS). In addition to the new data sets, some legacy OBS data, such as HY01-04 obtained by JAMSTEC in 2008 and KPr1-2 acquired by Japan Coast Guard in 2006, are also available in the study area. Most of the new and legacy OBS surveys recorded signals not only from on-line airgun shots but also from off-line ones, which can significantly improve spatial ray coverage in three dimensions but have not been fully used in previous studies. Multi-azimuth ray paths may also enable to constrain seismic anisotropy within the overriding plate and provide additional information on the stress field associated with ridge subduction.

In this presentation, we will first report the OBS refraction data newly acquired in the summer of 2021 (HYU03 and HYU04). For the data acquisition, a total of 100 OBSs were deployed at a 2 km interval on two seismic lines in the along-trough (HYU03) and across-trough (HYU04) directions and recorded acoustic signals generated by the 10,600 cu.in. airgun arrays of the R/V Kaimei. The HYU03 profile is the eastern extension of another along-trough line of HYU01, and the HYU04 profile is coincident with the legacy HY01 line. We plan to apply full waveform inversion analysis to the both data sets and obtain fine-scale velocity structure around the plate interface. We will also show the preliminary P-wave velocity volume constructed by 3D traveltimes tomography analysis incorporating the OBS refraction data from the multiple surveys mentioned above. Our previous 2D analysis on the HYU01 profile revealed significant structural heterogeneities including vertically extended low-velocity zones, which may indicate the root of mud volcanoes. We will examine this possibility from the viewpoint of 3D velocity structure.

Keywords: Hyuga-nada, Kyushu-Palau Ridge, 3D seismic velocity structure, Waveform inversion analysis